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TEST AND EVALUATION OF CASKET FOR HUMAN REMAINS INTENDED TO PRO--ETC(U)
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TEST AND EVALUATION OF CASKET FOR HUMAN
REMAINS INTENDED TO PROVIDE GUIDANCE
FOR SPECIFICATION IMPROVEMENT

AFALD/PTP
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Wright-Patterson AFB OH 45433

June 1977

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ABSTRACT

Test and evaluation of a casket for human remains was performed by the Air Force Packaging Evaluation Agency (AFPEA) as requested by AFLC/DEHM (Memorial Affairs Division). The purpose of the test and evaluation was to provide data to AFLC/DEHM where the results will aid in determining the direction to pursue in developing a new specification. The results of the test and evaluation indicated superior performance of 18 gauge metal when compared to the present 20 gauge. The hot melt/spot weld bottom panel is effective for sealing even after rough handling. All latching points on the lids should be directly opposite the hinges.

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INTRODUCTION

PURPOSE: This project was established to test and evaluate a casket fabricated from 18 gauge metal. Comparisons of impact test results from a previously tested 20 gauge casket were made. Primary objective is to use these results as an aid in developing a new specification to be more consistent with practices of the metal casket industry.

BACKGROUND: AFLC/DEHM is presently developing a new casket specification since the current requirements are no longer common or standard with the metal casket industry. The specification presently being used requires 20 gauge metal and spot welding not more than two inches apart on the bottom panel followed by soldering of the entire length and width of the seams. The 20 gauge casket has shown little resistance to impact when shipped encased in canvas overpacks. Canvas overpacks are used in approximately 45 percent of all Air Force commercial air shipments. The use of an alternative method of constructing the bottom panel of the casket is desired to bring the specification into a greater commonality with the metal casket industry.

As an aid in determining the direction to pursue in developing a new specification, AFLC/DEHM requested the Air Force Packaging Evaluation Agency (AFPEA) test an 18 gauge sealer casket using a hot melt adhesive on the bottom panel.

TEST SPECIMEN AND EQUIPMENT

ORIGINAL TEST SPECIMEN: The original casket submitted for testing was received on 28 September 1976. Outside dimensions of this casket were approximately 82 L x 27 W x 23 H inches. The weight of the casket without any internal furnishings was 143 pounds. The latching mechanism consisted of two lever-locks, one on each lid, equally spaced along the side. The bottom panel consisted of one piece of 18 gauge metal placed in the groove of the bottom frame of the casket, spot welded, and then the seam filled with hot melt adhesive.

Initial examination of the casket provided the following observations:

1. Failure of the lids to properly depress gasket. At both ends of the casket, the lids failed to touch the gasket even though the latches had been completely closed. This was evident, since it was actually possible to see light between the lids and the gasket at some of the corners.

2. The lids do not mate flush with each other. When the lids are completely latched down, the lids are not square with each other and thus do not form a smooth interface.

3. The head lid arm was bent.

4. The gasket on the lid bridge does not come into contact with the circumferential gasket on the bottom shell.

5. The lid gasket on the bridge towards the ends was not bonded and is free to move about.

It was concluded that the casket would not achieve a seal and would leak extensively at the lid interface and at the gasket on both ends. To verify this conclusion, an airtightness test was performed. The results supported the conclusion and subsequently a second casket was requested for testing.

SECOND TEST SPECIMEN: The replacement casket (herein termed casket) was received on 9 February 1977 (see Figures 1 and 2). Casket dimensions were approximately 82L x 27W x 23H inches with the weight without any internal furnishings being 148.5 pounds. The additional 5.5 pounds weight was attributed to the more complex latching arrangements. This new arrangement, consisting of four latching points, two on each lid directly across from the hinges, are made to latch by rotation of a crank at one end of the casket. (Latching points of the two caskets are compared in Figures 3 and 4). The bottom panel of the casket consists of one piece of 18 gauge metal placed in the bottom frame, spot welded at points 4 to 6 inches apart, sealed with hot melt adhesive, and braced by three cross members as shown in Figure 5. The lid bridge was arched as shown in Figure 6 with the gasket showing severe crimping at both ends as shown in Figure 7. The circumferential gasket was manufactured in a different shape and of different material than the original casket.

Initial examination of the casket provided the following observations:

1. The bridge gasket is severely creased at both ends of the bridge (see Figure 7).

2. The lids make contact at their interface when opened (see scratches in Figure 7).

From these observations, it is concluded that the casket has the highest probability of leakage at both ends of the bridge due to the severe creases in the gasket.

TEST EQUIPMENT: Low Temperature Chamber - Tenney Engineering Co.

Halide Gas Leak Detector - Turner Co., Model LP 777

Rectangular Suspension Frame - See Figure 10

Pendulum Impact Tester - See Figure 13

TEST PROCEDURES AND RESULTS

GENERAL: Tests conducted on the casket were performed with all internal furnishings removed. The internal view is illustrated in Figure 5.

INITIAL AIRTIGHTNESS TEST: The open casket was first cooled 20 degrees below ambient temperature (Fahrenheit) in the low temperature chamber for 30 minutes. While still in the chamber, some dichlorodifluoromethane refrigerant gas (Kaiser 12) was released into the casket and the lids drawn shut. The casket was then removed from the chamber and placed on a pallet in front of a large fan for 10 minutes. The fan served to disperse any residual gas concentrations about the casket and also expedite warming up of the casket. Warming up of the casket (20 degrees) to ambient temperature was calculated to induce an internal pressure of about 0.75 pounds per square inch to assist in detecting any leakage. The Halide Gas Leak Detector was moved along all seams, welds, and closures of the entire casket.

RESULTS: The test results indicated the presence of five leaks. Figure 8 illustrates their locations on the casket. The leak through the cap on the latching mechanism was very small although the gasket inside the cap makes no contact with the metal. Two leaks occurred in the bottom panel, both through the welds at the corners of the casket. The remaining two leaks were detected at both ends of the bridge between the two lids.

BOTTOM DEFORMATION TEST: The bottom deformation test was conducted in accordance with the procedure specified in Air Force Specification, "Care of Remains of Deceased Personnel," Amendment 5, Revised March 1976. The procedure specifies the casket to be loaded with a uniformly distributed load of 350 pounds and the lid closed and locked. The casket is then attached to a rectangular suspension frame by metal straps at six evenly spaced points along each side handle as close to the hardware attachment points as possible. The casket remained suspended for a period of 15 minutes and was examined for compliance with the requirements of the specification.

RESULTS: There was very little visual evidence of the bottom panel deformation. Logically, the greatest area of deformation occurred in the center of the bottom panel and by using a straight edge, evidence of this deformation was photographed and is displayed in Figure 9. The present specification requires the bottom panel to withstand a 350 pound load without deformation and in this respect the casket would not meet this requirement. However, visually the casket appeared to perform quite adequately.

HANDLE BEND TEST: The handle bend test was conducted in accordance with the specification and is a modification of the bottom deformation test. The modification calls for the casket to be suspended at two points on each side. These points were located midway between the lugs toward the ends of the casket. This test was then repeated on the end handles where each end was lifted separately using two points of suspension on the end handle being lifted. The specification requires that no signs of deformation exist during testing.

RESULTS: Test results indicate the handles show no signs of deformation (see Figure 10).

IMPACT TEST: The impact test was conducted in accordance with Method 5012 of Federal Test Method Standard No. 101. The casket was inserted in a canvas shipping container (see Figures 12 and 13) and the test conducted with a 200 pound test load. The casket was first impacted on the head end and then the foot end. Objectives of this test were (1) to compare the results with previous tests conducted on 20 gauge metal caskets (see Figure 11) and (2) to determine the effect of the impact on the bottom panel seal.

RESULTS: The casket was damaged slightly around the bottom frame at the head end. The effect was a small indentation or crease as shown in Figure 16 although almost undistinguishable. Another corner was separated and left a very small crack directly on the edge. The cap at the end of the latching mechanism was separated from its connecting chain (see Figure 14). This cap protrudes from the casket receiving much of the initial impact. This, in turn, caused the force to be transmitted through the entire latching mechanism slightly bending the latches (see Figure 15). Even though the rotation of the crank was found to be more difficult, the latching mechanism was still functional and acceptable.

In the comparison with the 20 gauge casket (see Figure 11), the 18 gauge casket resisted the impact with very little damage. On the other hand, the 20 gauge casket experienced serious damage in several areas. Visual observations of the 20 gauge casket indicated

many large indentations (see Figures 17 and 18) and separation of the cover from the latching mechanism (see Figure 19). The affect of the impact on the bottom panel seal of the 18 gauge casket was tested in the final airtightness test.

FINAL AIRTIGHTNESS TEST: The procedure for the final airtightness test was the same as that used for the initial airtightness test.

RESULTS: Those leaks found in the initial airtightness test results were still present during the final airtightness test. In addition, the casket leaked from the crack on the edge which was created by the impact test. The bottom panel indicated no evidence of leakage along any of the seams.

CONCLUSIONS

The 18 gauge casket was unable to attain an airtight seal at any point during the testing sequence. The major areas of leakage occurred at both ends of the lid bridge where large leaks were detected, and in the bottom panel where there were two small leaks through the welds. The bottom panel deformation test revealed a slight deformation under a 350 pound load with no degradation of performance or visual appearance. The handle bend test was satisfied without any deformation. Results of the impact test indicate the superior resistance of the 18 gauge casket when compared with a 20 gauge casket. The bottom panel sealing and construction of the 18 gauge casket was adequate for the tests conducted in this sequence. The circumferential gasket remained sealed at all times during the testing procedures while the bridge gasket was not able to seal at anytime.

RECOMMENDATIONS

As a result of the tests conducted during this project it is felt the following recommendations should be considered when drafting the new specification:

1. Specify all latching points to be directly opposite the hinges. This condition should allow a greater uniform compression of the circumferential gasket.
2. Modify the airtightness test through deletion of the carbon tetrachloride and substitution of freon refrigerant gas. Also recommend deletion of the General Electric Halogen Leak Detector (Type H-6) and substitute Turner Halide Gas Leak Detector Model LP 777 or equivalent.

3. Specify the bridge between the lids be flat instead of arched (see Figure 6). This would prevent unnecessary bending and creasing of the bridge gasket at the ends.

4. Specify the use of 18 gauge metal for construction of the casket due to its superior resistance to rough handling.

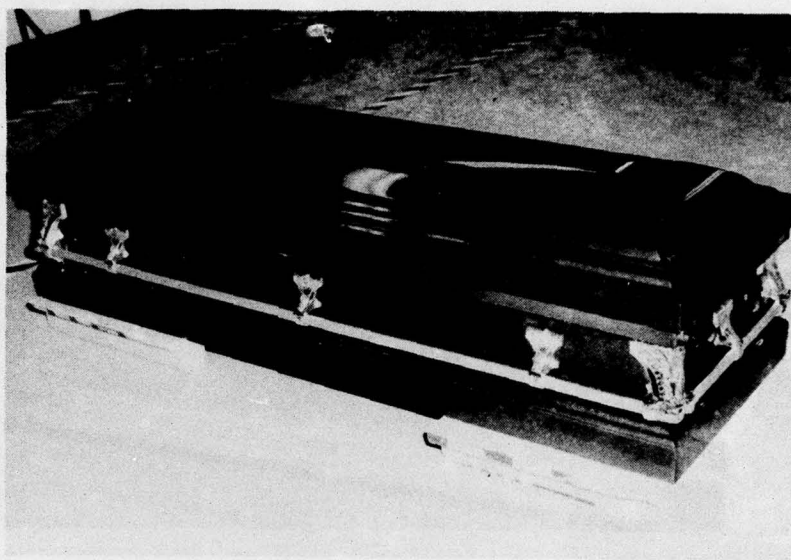


FIGURE 1. FRONTAL VIEW OF REPLACEMENT CASKET

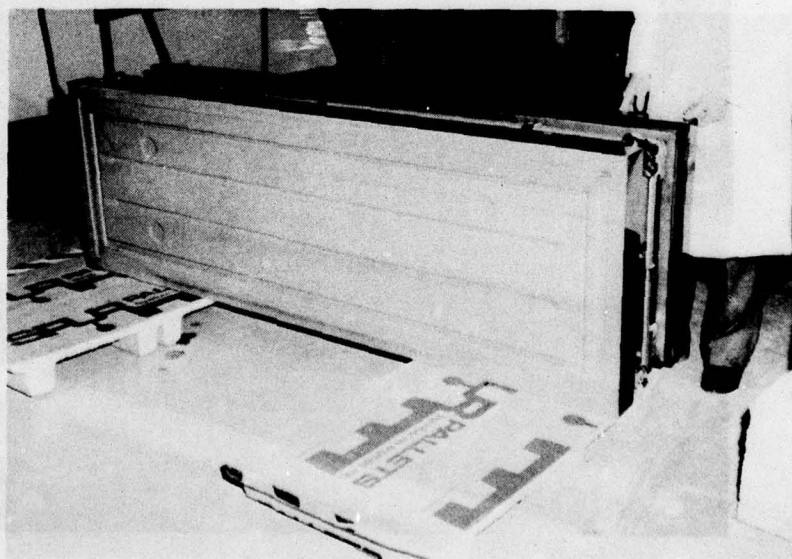


FIGURE 2. BOTTOM PANEL OF REPLACEMENT CASKET

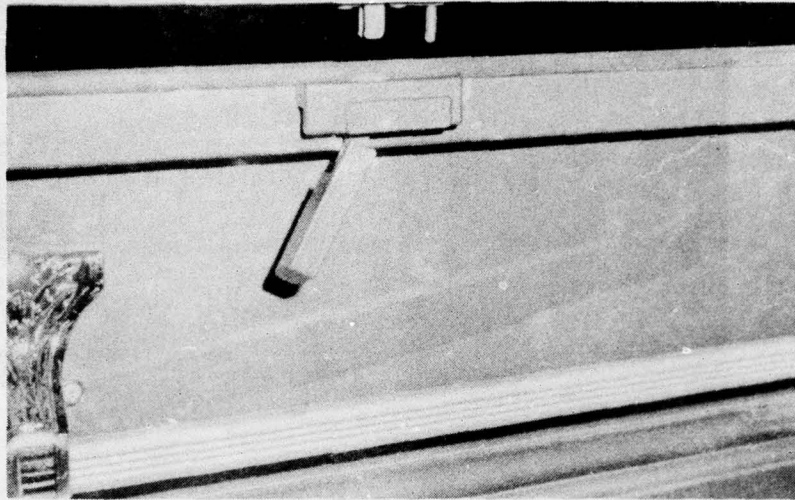


FIGURE 3. ORIGINAL CASKET LEVER-LOCK

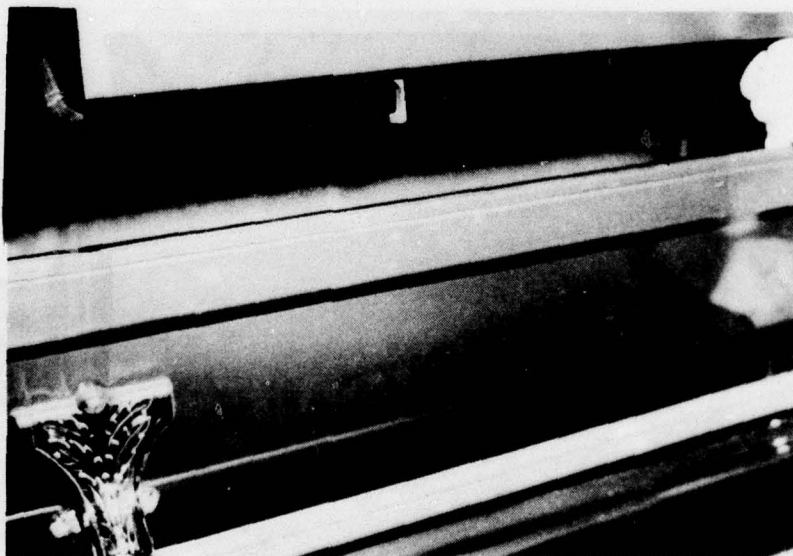


FIGURE 4. REPLACEMENT CASKET LATCHING MECHANISM

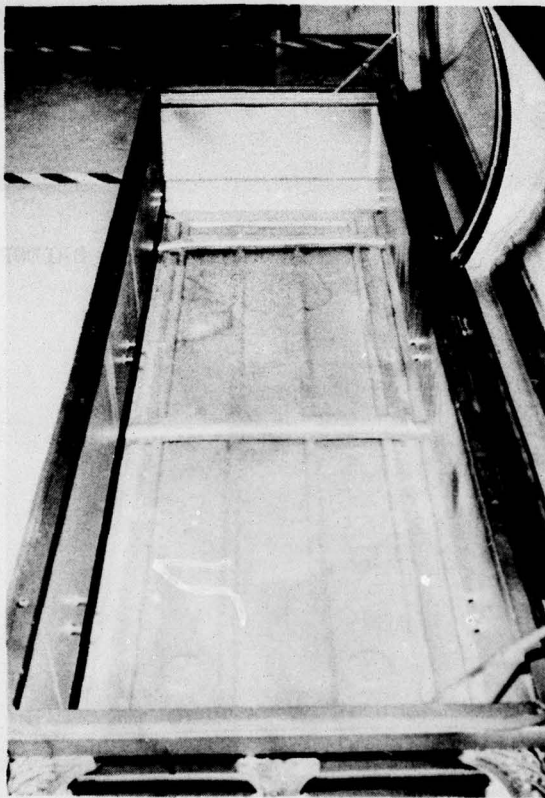


FIGURE 5. REPLACEMENT CASKET,
INTERNAL VIEW OF BOTTOM PANEL.
NOTE HOT MELT ADHESIVE IN CHANNEL.

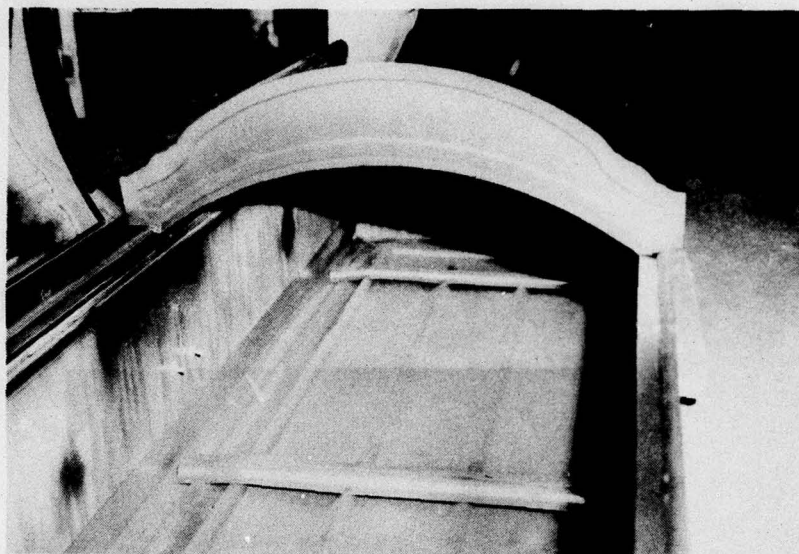


FIGURE 6. ARCHED LID AND BRIDGE



FIGURE 7. CLOSE-UP OF ARCHED LID AND BRIDGE.
NOTE SEVERE CREASING AT THE BEND; ALSO,
SCRATCHES ON LID WHERE SURFACES MAKE CONTACT.

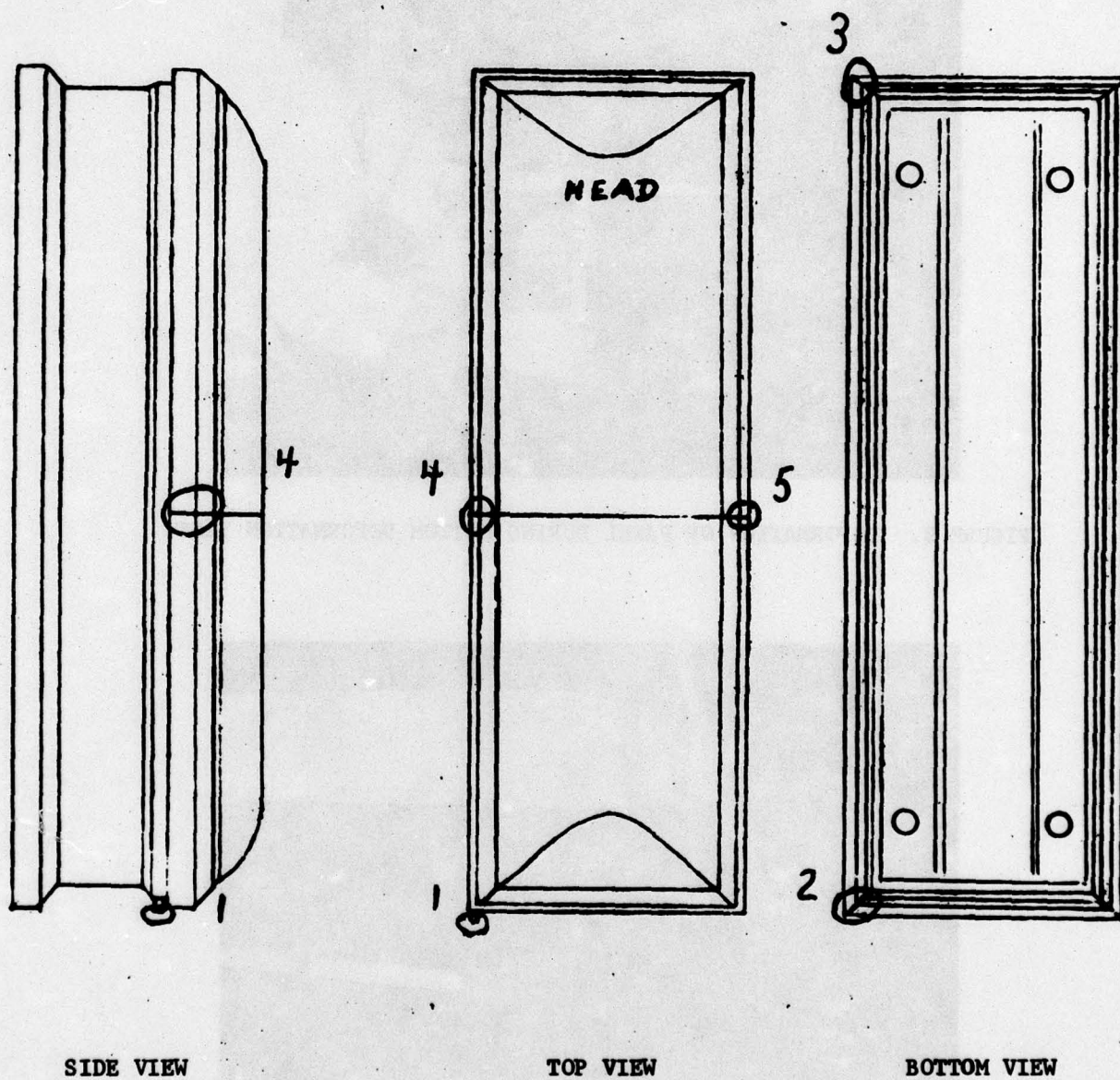


FIGURE 8. LEAKS FOUND DURING INITIAL AIRTIGHTNESS TEST



FIGURE 9. DEFORMATION OF PANEL DURING BOTTOM DEFORMATION TEST

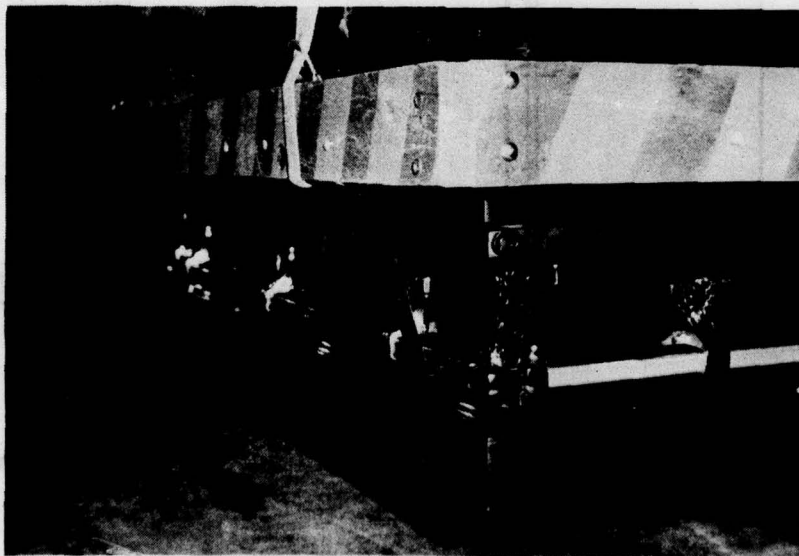


FIGURE 10. HANDLE BEND TEST

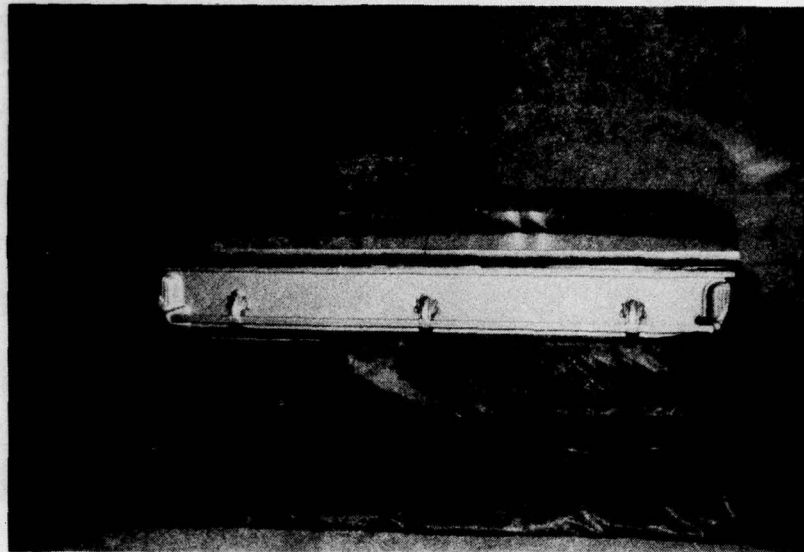


FIGURE 11. TWENTY GAUGE CASKET IN PADDED CANVAS OVERPACK

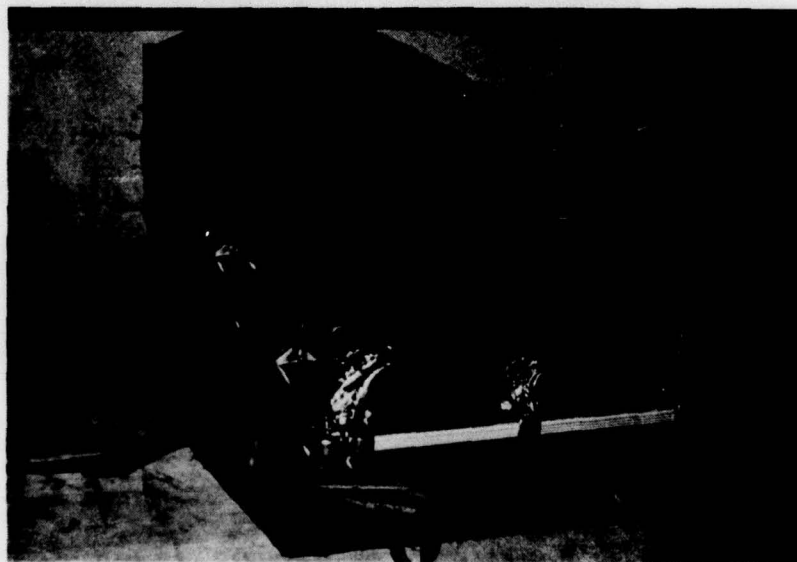


FIGURE 12. EIGHTEEN GAUGE CASKET IN NON-PADDED CANVAS OVERPACK AND CORRUGATED COVER

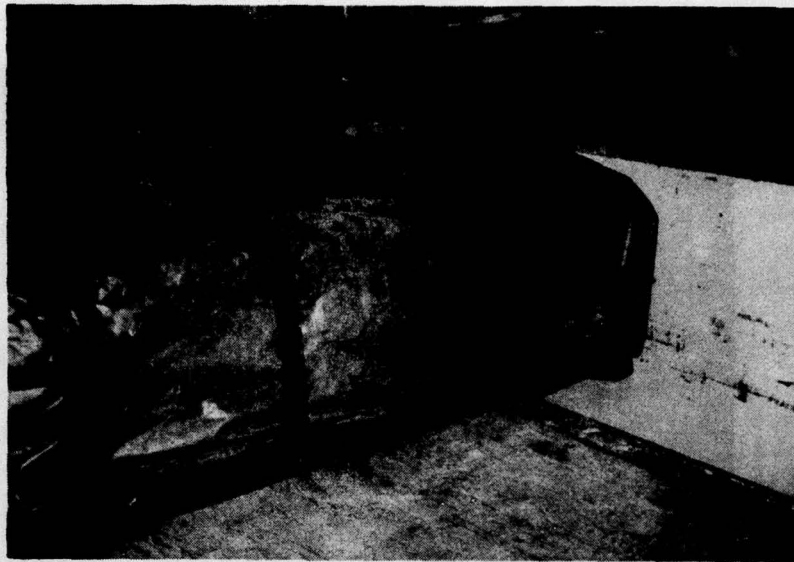


FIGURE 13. SET-UP FOR PENDULUM IMPACT TEST



FIGURE 14. BROKEN CHAIN TO CAP CAUSED BY IMPACT

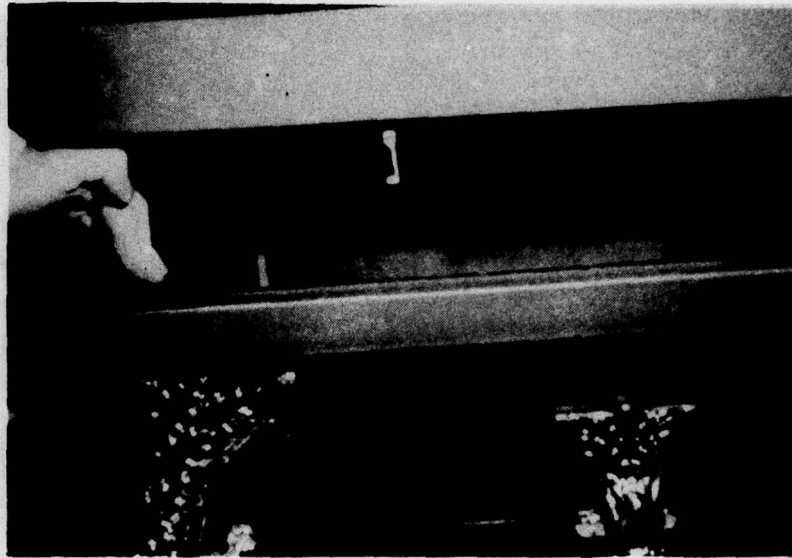


FIGURE 15. SLIGHTLY BENT LATCH DAMAGED FROM IMPACT

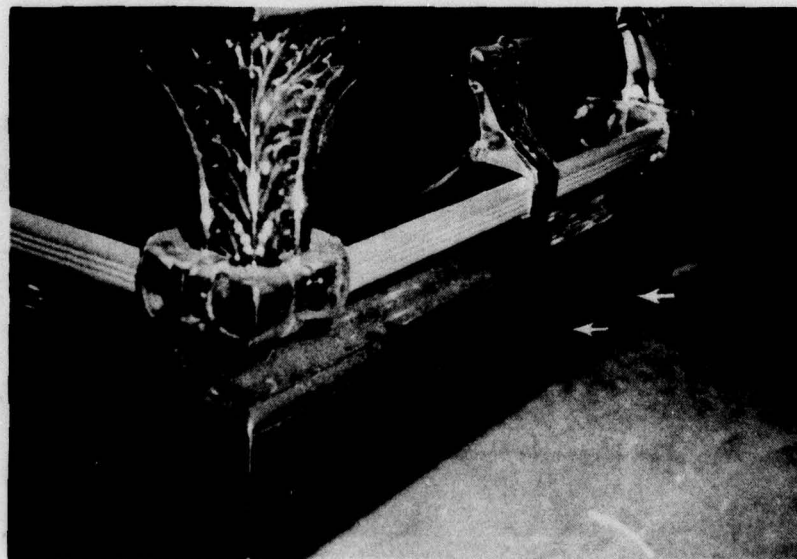


FIGURE 16. SLIGHT DAMAGE FROM IMPACT TO EIGHTEEN GAUGE CASKET

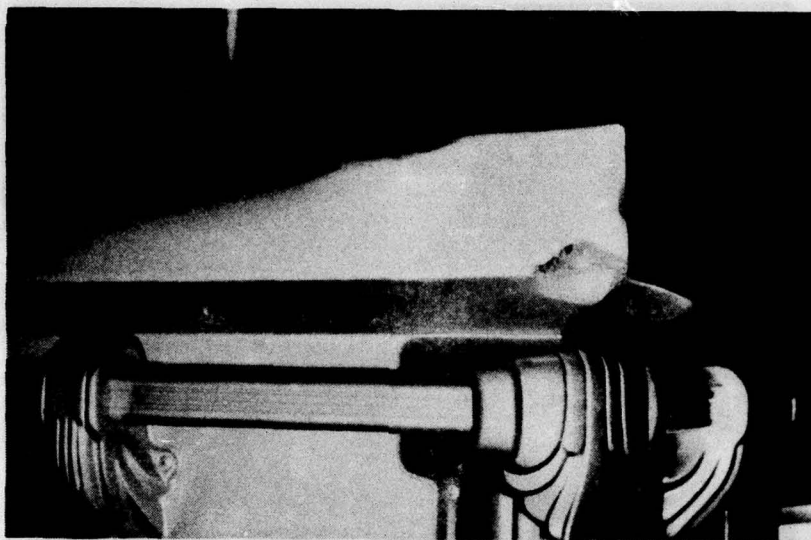


FIGURE 17. MAJOR DAMAGE TO TWENTY GAUGE CASKET
IN PADDED OVERPACK. DAMAGE IS DUE TO IMPACT.

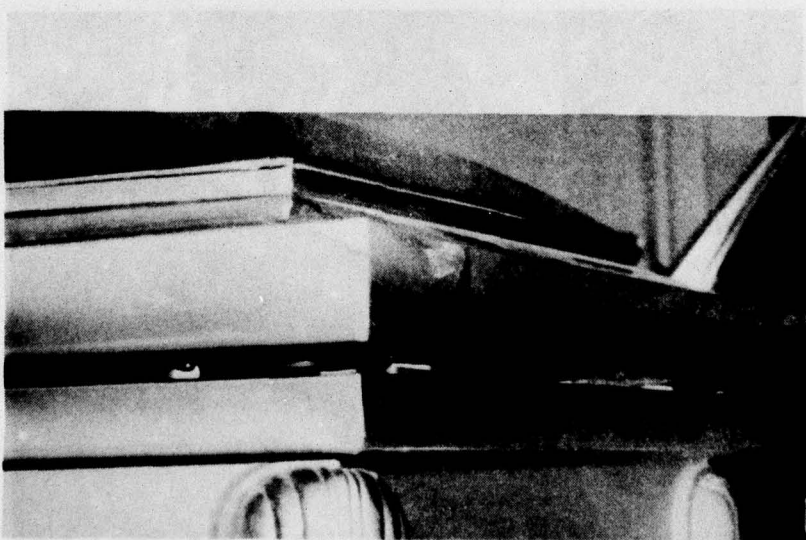
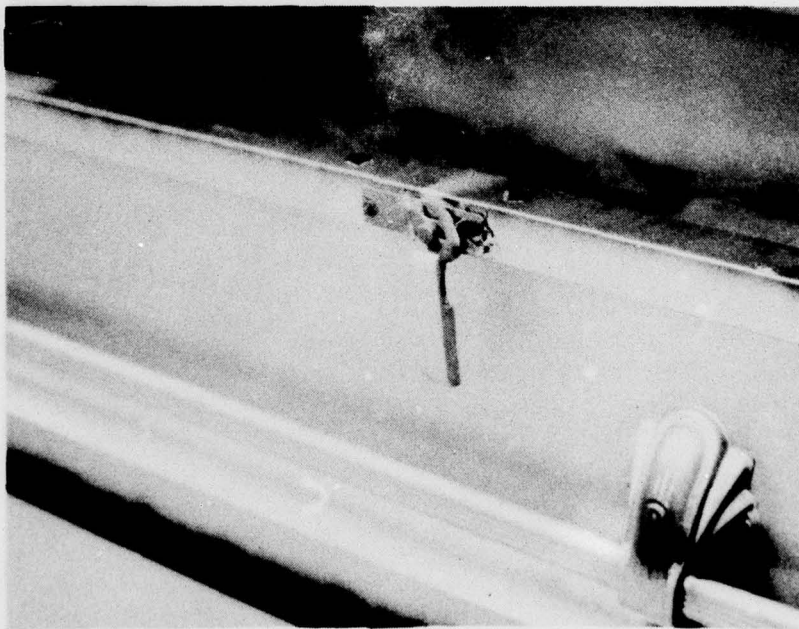


FIGURE 18. DAMAGE TO TWENTY GAUGE
CASKET LID AS A RESULT OF IMPACT



**FIGURE 19. BROKEN LATCH COVER DUE TO IMPACT TO
TWENTY GAUGE CASSET IN PADDED CANVAS OVERPACK.**

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